REMARKS

This application has been carefully reviewed in light of the Office Action dated April 4, 2005. Claims 22-26 and 28-31 remain in this application. Claim 27 has been canceled without prejudice. Claims 22 and 23 are the independent Claims. Claims 25, 28, and 30 have been amended. It is believed that no new matter is involved in the amendments or arguments presented herein. Reconsideration and entrance of the amendment in the application are respectfully requested.

Claim Objection

Claims 22-31 were objected to under 35 U.S.C. § 132 for introducing new matter into the disclosure. In particular, the Office Action cited the following as being not supported by the original disclosure: The associated capacitor (first-stage capacitor) having a higher frequency response than that of at least one of the other capacitor of the subsequent stages and to the primary supply voltage is stepped down to provided the secondary power supply voltage and each of the stages is a stepped down stage.

Applicant respectfully recites portion of independent Claim 22, which is the subject of the Office Action's objection: said associated capacitor having a higher frequency response than that of at least one of the other said capacitors of the subsequent stages.

Applicant notes the above recited portion of independent Claim 22 requires, *inter alia*, that the first stage capacitor having a relationship to the other capacitors. In particular, the relationship is that the first stage capacitor has a higher frequency response, i.e. it operates better at a higher frequency than at least one of the other capacitors.

In the Specification, the description of the inventive MOS capacitor is directed toward a capacitor that will have a saturation capacitance that is closed to the static capacitance at 0 frequency. This is illustrated in Figure 8 of Specification, wherein the capacitance can be seen to be approximately 750 pF at approximately 2V (the solid line). On page 12 of Specification, the following paragraph in the "Background of the Invention" section sets forth that the disclosed MOS capacitor has an improved frequency response over that of the conventional prior art MOS capacitor: In this way, some of the gate resistance R_g and the n-well resistance R_n/w is reduced to decrease undesirable frequency response that would be otherwise caused by the resistances Rg and Rn/w. Accordingly, although the capacitance of each MOS capacitor is voltage dependent, the frequency response of the MOS capacitor is improved. This is the case even for high frequency operation of the charge pump circuit, so that the stepped-up performance of the charge pump circuit is secured.

Figure 8 of Specification illustrates the voltage-capacitor characteristics of the disclosed MOS capacitor. At a frequency of 1 MHz, the response of the disclosed MOS capacitor is improved over the prior art MOS capacitor.

Moreover, Applicant recites the first full paragraph on Page 13 of Specification: Although the invention MOS capacitor has a little voltage independence, it attained the large capacitance close to the static (saturation) capacitance of about 750pF (dotted line) under a relatively low applied voltage (about 2V) even when the switching frequency is as high as 1 MHz. That is, the MOS capacitor has a saturation capacitance close to that of the static capacitance (i.e., capacitance for 0 frequency).

It is clear from the above that the improved MOS capacitor exhibits a saturation capacitance that is essentially the static capacitance at higher frequency (i.e., 1 MHz operation) as compared to the prior art MOS capacitor.

The relationship of the first stage capacitor to the other capacitors are set forth in the last paragraph on Page 14 of Specification, and recited below for the Office's convenience: Effective application of the inventive MOS capacitor to a charge pump circuit is to use the MOS capacitor in the early stages of the circuit as shown in Fig. 1 where the capacitance C still has a voltage dependence under a given applied voltage, i.e., the V_g-C characteristics is not saturated yet. Therefore, it is preferred to use the inventive MOS capacitor in the first stage of a charge pump circuit where a capacitor is subjected to a lower voltage.

It is clear from the above that it is undesirable to utilize a prior art capacitor in the first stage at the lower voltage because it does not enter saturation region of operation at when operating at high frequency (1 MHz). The preferred approach, as set forth in the Specification and recited in independent Claim 22, is to use the disclosed inventive MOS capacitor of the present invention at least in the first stage. The later stages of capacitances may remain the prior art capacitors.

With respect to Office Action's objection to the claims and the addition of new matter, the claims set forth that the first stage capacitor has a higher frequency response than that of at least one of the capacitor in the subsequent stages. Specification of the present invention discloses that the first stage capacitor has a V_g-C characteristics that exhibits better capacitance at high frequency, i.e., it has a higher frequency response than at least one of the subsequent stage capacitor. Moreover, in Abstract of Specification, includes, "the MOS capacitors have improve frequency response." Thus the Abstract sets forth that the disclosed MOS capacitors have improved frequency response and the definition of "improved", as

disclosed in Specification, is that it has higher frequency response. Applicant thus respectfully submits that the support for the claims added in amendment dated February 22, 2005, are fully supported in the Specification.

According to Office Action, the new matter added include "stepped-down" to provide the secondary power supply voltage and each of the stage is a stepped-down stage. However, the Specification sets forth one embodiment of the present invention, which is a stepped-up charge pump. The claims recite, "secondary power supply voltage obtained by stepping a primary supply voltage level using a charge pump circuit..." The claims do not specifically require the claimed stepping to be stepping-down, and are thus supported by the Specification. Moreover, although the preferred embodiment discusses a stepped-up charge pump, the claims are not required to limit thereto.

Claim 26 reciting that the primary supply voltage is "stepped-up," is thus supported by the Specification. Claim 27 reciting "stepped-down" operation has been canceled, rendering moot the objection thereto.

Accordingly, Applicant respectfully submits that Claims 22-26 and 28-31, submitted in amendment dated February 22, 2005, are supported in the original disclosure. Reconsideration and withdrawal of the above § 132 objection are respectfully requested.

Non-Art Based Rejections

Claims 22-31 were rejected under 35 U.S.C. § 112, first paragraph, for failing to comply with the written description requirement. Moreover, Claim 25 was rejected for insufficient antecedent basis.

With respect to Claims 22-31, the Office Action cited the same subject matters as those cited in the § 132 objection. Applicant respectfully submits the

claims satisfy the requirement under § 112 for the at least the same reasons as those discussed above in connection with the § 132 objection. Claim 27 has been canceled.

Claims 25, 28, and 30 have been amended to recite "associated capacitor," to remedy the insufficient antecedent basis.

Reconsideration and withdrawal of the above § 112 rejections are respectfully request.

Art-Based Rejections

Claims 22-26 and 29-31 were rejected under 35 U.S.C. § 102(e) over Applicant's Prior Art (APR). APR was specified as Figures 1 and 4 of Specification. (*See, Office Action; Page 4, Para. 4).* Applicant respectfully traverses the rejections and submits that the claims herein are patentable in light of the clarifying amendments above and the arguments below.

The Claims are Patentable Over the Cited References

The present application is generally directed to a semiconductor apparatus having a charge pump which includes MOS type capacitors .

As defined by independent Claim 22, a driver for driving a load with a secondary power supply voltage obtained by stepping a primary supply voltage level uses a charge pump circuit that has a multiplicity of stages. Each of the stages includes a switching element and a capacitor. An associated capacitor of the first stage of the charge pump circuit is energized by the one of the voltages impressed on the capacitors of the multiplicity of stages that is closest in value to the primary supply voltage level. The associated capacitor has a higher frequency response than that of at least one of the other capacitors of the subsequent stages.

The applied reference is not seen to disclose or suggest the above features of the present invention as defined by independent Claim 22. In particular, applied reference does not disclose or suggest, "said associated capacitor having a higher frequency response than that of at least one of the other said capacitors of the subsequent stages," as required by independent Claim 22.

APR is described in "Background of the Invention" of the Specification. In paragraph 4, Page 2 of the Specification, it is set forth that: Thus, in forming a charge pump circuit on one semiconductor chip together with a low-voltage circuit (not shown), their capacitors C1-Cn-1 are mostly MOS capacitors, aligned in shape and size with other MOS transistors. Such MOS capacitors are described in detail below with reference to FIGS. 2 and 3.

It is clear from above that APR discloses identical capacitors for the charge pump. Figures 2 and 3 illustrate a capacitor, which is used for all capacitors.

Accordingly, APR does not teach or suggest the above feature recited in independent Claim 22.

Moreover, Applicant notes the frequency response recited in independent Claim 22 refers to the frequency response of the capacitor by itself and not within the operation of the charge pump. Thus, if one utilizes tow capacitors under the same operation conditions, one will have a better frequency response than the other, indicating two different capacitors. If one utilizes the two capacitors in different operating environments, then they have different frequency response due to the saturation capacitance of the capacitor at the voltage. Applicant respectfully submits that the Specification of the present invention is consistent in disclosing the structure of the capacitor providing an improved frequency response to the capacitor, not as a result of the charge pump operation.

Moreover, the Background section of Specification sets forth that it is a limitation of APR to utilize the same capacitor in all stages. In contrast, the last paragraph of the Specification sets forth that at least the first stage of the capacitors of a charge pump of present invention must be different.

Furthermore, the Office Action did not specify how the APR discloses that the first stage capacitor has a lower internal resistance than the capacitors of the subsequent stages. As discerned above, the Specification of present invention consistently refers to the frequency response characteristics of the capacitors itself (improved by the structure thereof), and not the capacitor within charge pump operation. APR discloses the capacitors are identical thus cannot have the first stage capacitor having a better frequency response. Applicant respectfully requests the Office to provide additional information on this assertion, and thus allows Applicant to provide additional and proper responses to the Office Action.

In light of the foregoing, the applied reference does not teach or suggest the above features of the present invention as recited in the independent Claim 22.

Since the cited reference fails to disclose, teach or suggest the above features recited in independent Claim 22, the reference cannot be said to anticipate or render obvious the invention which is the subject matter of the claim.

Accordingly, independent Claim 22 is believed to be in condition for allowance and such allowance is respectfully requested.

Applicant respectfully submits that independent Claim 23 is allowable for the least the same reasons as those discussed in connection with independent Claim 22.

The remaining claims depend either directly or indirectly from independent Claims 22 and 23, and recite additional features of the invention which are neither

disclosed nor fairly suggested by the applied references and are therefore also believed to be in condition for allowance.

Conclusion

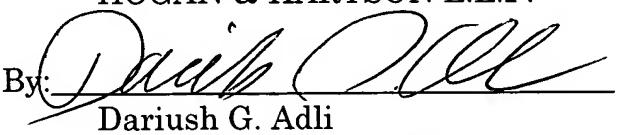
In view of the foregoing, it is respectfully submitted that the application is in condition for allowance. Reexamination and reconsideration of the application, as amended, are requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Los Angeles, California telephone number (213) 337-6809 to discuss the steps necessary for placing the application in condition for allowance.

If there are any fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-1314.

Respectfully submitted,
HOGAN & HARTSON L.L.P.

Date: September 27, 2005

By: 
Dariush G. Adli
Registration No. 51,386
Attorney for Applicant(s)

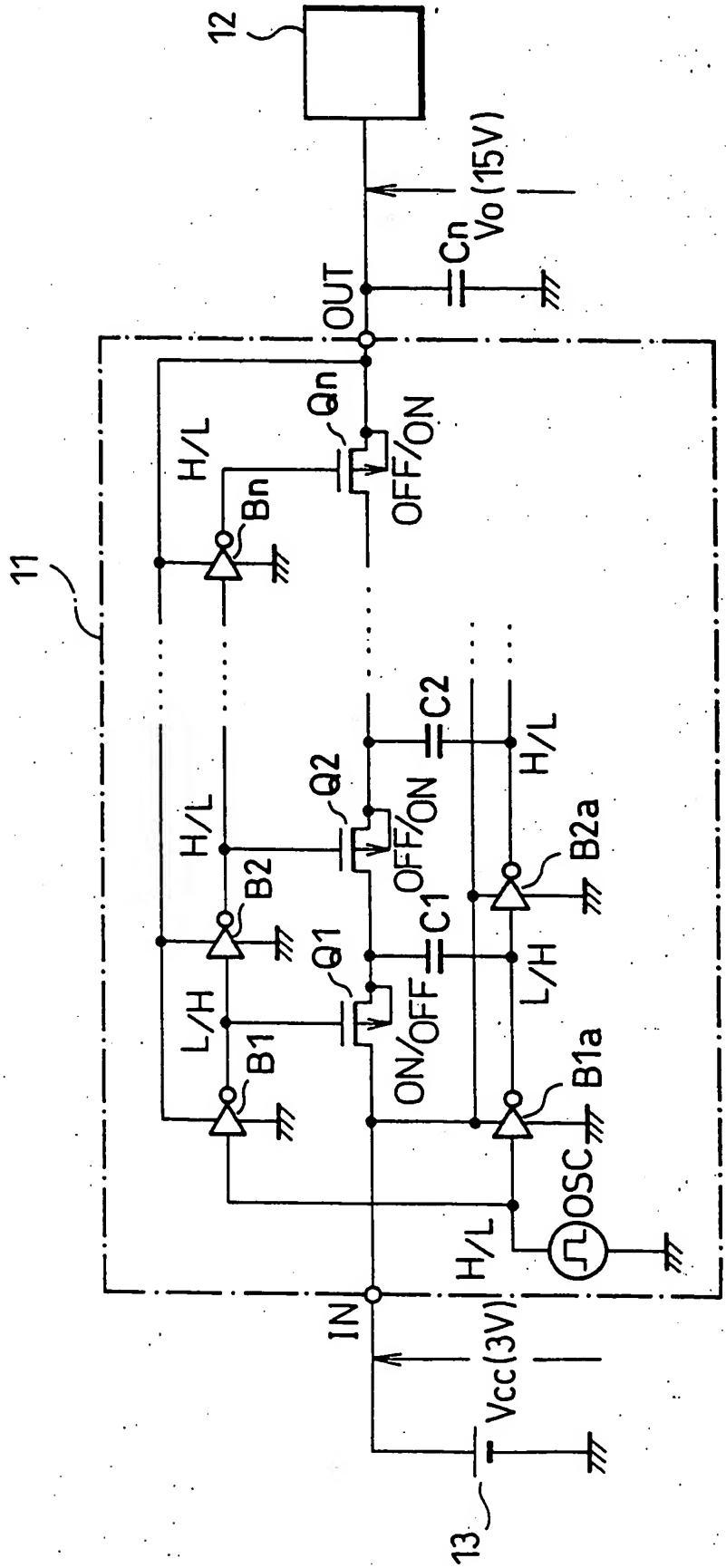
500 South Grand Avenue, Suite 1900
Los Angeles, California 90071
Phone: 213-337-6700
Fax: 213-337-6701

Amendments to the Drawings:

The attached sheets of drawings include changes to Figs. 1-4. These sheets, which include Figs. 1-4, replaces the original sheets including Figs. 1-4. In Figures 1-4, previously omitted element "Prior Art" has been ADDED.

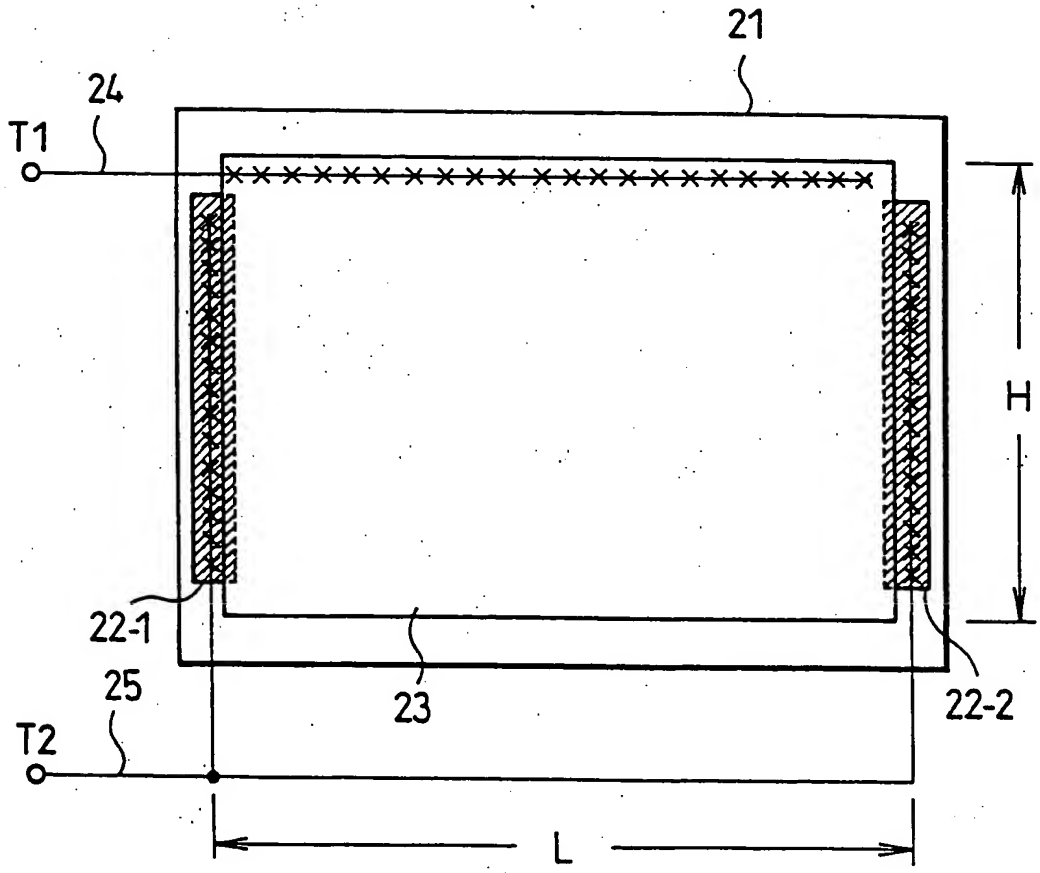
Attachment: Replacement Sheets
Annotated Sheets Showing Changes

FIG.1



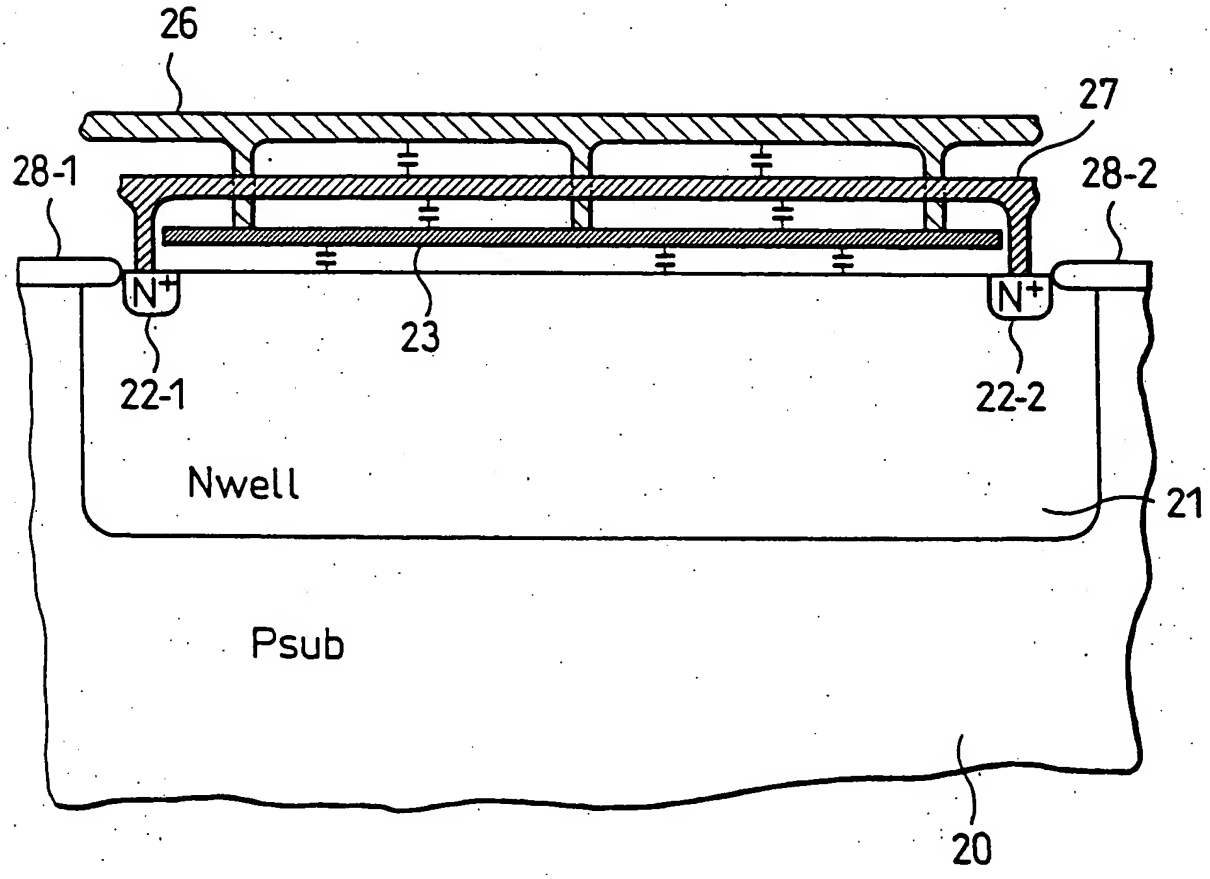
Prior Art

FIG. 2



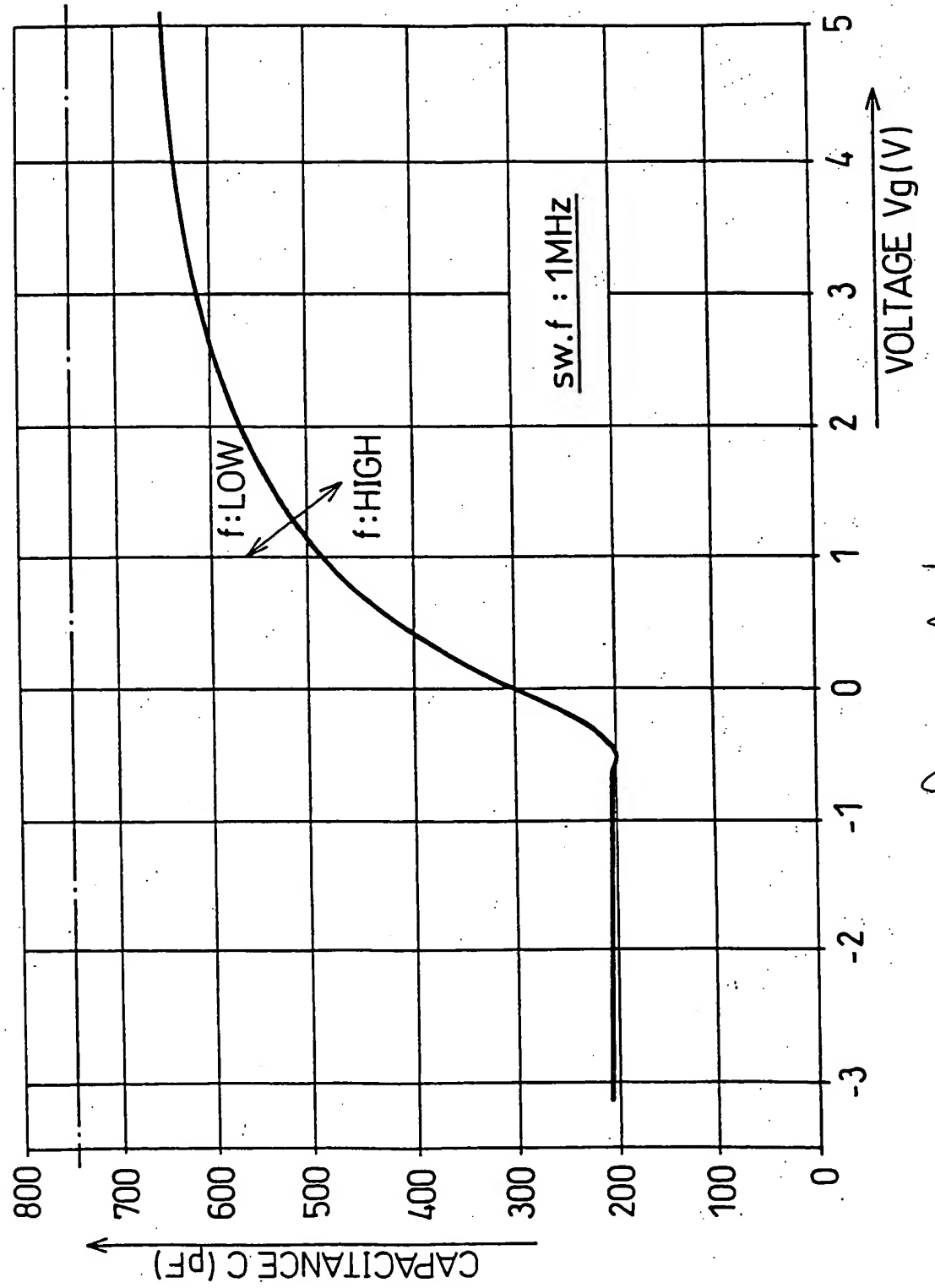
Prior Art

FIG.3



Prior Art

FIG.4



Prior Art